

What is claimed is:

1. An optical head having:

a bobbin formed with a center hole and

a first optical lens mounted on said bobbin via

5 a thermal expansion adjustment member formed with an opening,

said first optical lens having a substrate formed by an optical material different from said bobbin in coefficient of thermal expansion,

10 said substrate having:

a convex part functioning as a convex lens and

a flat part positioned around said convex part,

said flat part is fixed to said thermal

expansion adjustment member so that said convex part fits  
15 in said opening, and

said first optical lens is placed so that a center axis of said convex part or an extension thereof passes through the center hole of said bobbin.

2. An optical head as set forth in claim 1,

20 wherein

the coefficient of thermal expansion of said thermal expansion adjustment member is a value between the coefficient of thermal expansion of said bobbin and the coefficient of thermal expansion of said first

25 optical lens.

3. An optical head as set forth in claim 1,  
wherein said thermal expansion adjustment member is fixed  
to said bobbin.

4. An optical head as set forth in claim 1,  
5 wherein said thermal expansion adjustment member is fixed  
to said bobbin via a spacer.

5. An optical head as set forth in claim 1,  
wherein a second optical lens is arranged at the center  
hole of said bobbin.

10 6. An optical head as set forth in claim 1,  
wherein

said thermal expansion adjustment member is an  
optical material having a constant or substantially  
constant thickness and is formed by the same material as  
15 the optical material of said first optical lens and  
the height of said convex part from the surface  
of said flat part is lower than the thickness of said  
thermal expansion adjustment member.

7. An optical head as set forth in claim 1,  
20 wherein:

the center axis of said convex part coincides  
or substantially coincides with the center axis of the  
center hole of said bobbin;

a groove is formed around said convex part;  
25 a coil is wound around an outer circumference

of said bobbin;

the material of said bobbin is plastic; and  
the material of said first optical lens is  
glass.

5           8.   An optical head having:

a bobbin formed with a center hole and  
an optical lens mounted on said bobbin via a  
thermal expansion adjustment member,

10           said optical lens having a substrate formed by  
an optical material different from said bobbin in  
coefficient of thermal expansion,

            said substrate having:

a convex part functioning as a convex lens;  
a flat part positioned around said convex part;

15   and

an outer circumference part positioned around  
said flat part, wherein

a thickness of said outer circumference part is  
greater than that of said convex part;

20           said outer circumference part is fixed to said  
thermal expansion adjustment member; and

            said optical lens is placed so that a center  
axis of said convex part or an extension thereof passes  
through the center hole of said bobbin.

25           9.   An optical head as set forth in claim 8,

wherein a coefficient of thermal expansion of said thermal expansion adjustment member is a value between the coefficient of thermal expansion of said bobbin and the coefficient of thermal expansion of said optical lens.

10. An optical head as set forth in claim 8, wherein said thermal expansion adjustment member is fixed to said bobbin.

11. An optical head as set forth in claim 8, wherein said thermal expansion adjustment member is an optical material having a constant or substantially constant thickness and is formed by the same material as the optical material of said optical lens.

12. An optical head as set forth in claim 8, wherein

said thermal expansion adjustment member is formed with an opening and

said optical lens is placed so that said convex part protrudes to said opening.

13. An optical head as set forth in claim 8, wherein a mask layer is formed on a surface of said outer circumference part and said mask layer of said outer circumference part is fixed to said thermal expansion adjustment member.

14. An optical head as set forth in claim 8,

wherein

the center axis of said convex part coincides  
or substantially coincides with the center axis of the  
center hole of said bobbin;

5 a groove is formed around said convex part;  
a coil is wound around an outer circumference  
of said bobbin;

the material of said bobbin is plastic; and  
the material of said optical lens is glass.

10 15. An optical head having:

a bobbin formed with a center hole and  
an optical lens,

said optical lens having a substrate formed by  
an optical material different from said bobbin in  
15 coefficient of thermal expansion,

said substrate having:

a convex part functioning as a convex lens;  
a flat part positioned around said convex part;

and

20 an outer circumference part positioned around  
said flat part, wherein

a thickness of said outer circumference part is  
greater than that of said convex part;

said outer circumference part is fixed to said  
25 bobbin; and

said optical lens is placed so that a center axis of said convex part or an extension thereof passes through the center hole of said bobbin.

16. An optical head as set forth in claim 15,  
5 wherein a mask layer is formed on a surface of said outer circumference part and said mask layer of said outer circumference part is fixed to said bobbin.

17. An optical head as set forth in claim 15,  
wherein

10 the center axis of said convex part coincides or substantially coincides with the center axis of the center hole of said bobbin;

a groove is formed around said convex part;

15 a coil is wound around an outer circumference of said bobbin;

the material of said bobbin is plastic; and

the material of said optical lens is glass.

18. An optical pickup having:

20 an optical head functioning as an object lens part when mounted in a recording and/or reproducing apparatus of an optical storage medium and

a photodetector for receiving a reflected light beam for use in recording and/or reproduction to and from the optical storage medium,

25 said optical head having

a bobbin formed with a center hole and  
a first optical lens mounted on said bobbin via  
a thermal expansion adjustment member formed with an  
opening,

5           said first optical lens having a substrate  
formed by an optical material different from said bobbin  
in coefficient of thermal expansion,

          said substrate having  
          a convex part functioning as a convex lens and  
10           a flat part positioned around said convex part,  
          said flat part is fixed to said thermal  
expansion adjustment member so that said convex part fits  
in said opening, and

          said first optical lens is placed so that a  
15          center axis of said convex part or an extension thereof  
passes through the center hole of said bobbin.

19. An optical pickup as set forth in claim 18,  
wherein

          the coefficient of thermal expansion of said  
20          thermal expansion adjustment member is a value between  
the coefficient of thermal expansion of said bobbin and  
the coefficient of thermal expansion of said first  
optical lens.

20. An optical pickup as set forth in claim 18,  
25          wherein said thermal expansion adjustment member is fixed

21. An optical pickup as set forth in claim 18,  
wherein said thermal expansion adjustment member is fixed  
to said bobbin via a spacer.

5           22.   An optical pickup as set forth in claim 18,  
          wherein

a second optical lens is placed at the center  
hole of said bobbin and

a light beam is supplied irradiated from a  
10 recording and/or reproducing light beam generating  
apparatus and passed through said second optical lens to  
said first optical lens.

23. An optical pickup as set forth in claim 18,  
wherein

15           said thermal expansion adjustment member is an  
optical material having a constant or substantially  
constant thickness and is formed by the same material as  
said first optical lens and

the height of said convex part from the surface  
20 of said flat part is lower than the thickness of said  
thermal expansion adjustment member.

24. An optical pickup as set forth in claim 18,  
further having a magnet,

the center axis of said convex part coincides  
25 or substantially coincides with the center axis of the



center hole of said bobbin,

a groove is formed around said convex part,

a coil is wound around an outer circumference  
of said bobbin,

5 the material of said bobbin is plastic,

the material of said first optical lens is  
glass, and

said magnet and said coil configure an actuator  
for moving said bobbin.

10 25. An optical pickup having:

an optical head functioning as an object lens  
part when mounted in a recording and/or reproducing  
apparatus of an optical storage medium and

a photodetector for receiving a reflected light  
15 beam for use in recording and/or reproduction to and from  
the optical storage medium,

said optical head having

a bobbin formed with a center hole and

an optical lens mounted on said bobbin via a  
20 thermal expansion adjustment member,

said optical lens having a substrate formed by  
an optical material different from said bobbin in  
coefficient of thermal expansion,

said substrate having:

25 a convex part functioning as a convex lens;

a flat part positioned around said convex part;  
and

an outer circumference part positioned around  
said flat part,

5 a thickness of said outer circumference part is  
greater than that of said convex part,

said outer circumference part is fixed to said  
thermal expansion adjustment member, and

10 said optical lens is placed so that a center  
axis of said convex part or an extension thereof passes  
through the center hole of said bobbin.

26. An optical pickup as set forth in claim 25,  
wherein a coefficient of thermal expansion of said  
thermal expansion adjustment member is a value between  
15 the coefficient of thermal expansion of said bobbin and  
the coefficient of thermal expansion of said optical  
lens.

27. An optical head as set forth in claim 25,  
wherein said thermal expansion adjustment member is fixed  
20 to said bobbin.

28. An optical pickup as set forth in claim 25,  
wherein

said thermal expansion adjustment member is an  
optical material having a constant or substantially  
25 constant thickness and is formed by the same material as

said optical lens and

a light beam is supplied irradiated from a  
recording and/or reproducing light beam generating  
apparatus and passed through said thermal expansion  
5 adjustment member.

29. An optical pickup as set forth in claim 25,  
wherein

said thermal expansion adjustment member is  
formed with an opening and

10 said optical lens is placed so that said convex  
part protrudes to said opening.

30. An optical pickup as set forth in claim 25,  
wherein a mask layer is formed on a surface of said outer  
circumference part and said mask layer of said outer  
15 circumference part is fixed to said thermal expansion  
adjustment member.

31. An optical pickup as set forth in claim 25,  
further having a magnet,

the center axis of said convex part coincides  
20 or substantially coincides with the center axis of the  
center hole of said bobbin,

a groove is formed around said convex part,  
the material of said bobbin is plastic,  
the material of said optical lens is glass, and  
25 said magnet and said coil configure an actuator

for moving said bobbin.

32. An optical pickup having:

an optical head functioning as an object lens  
part when mounted in a recording and/or reproducing

5 apparatus of an optical storage medium and

a photodetector for receiving a reflected light  
beam for use in recording and/or reproduction to and from  
the optical storage medium,

said optical head having

10 a bobbin formed with a center hole and  
an optical lens,

said optical lens having a substrate formed by  
an optical material different from said bobbin in  
coefficient of thermal expansion,

15 said substrate having:

a convex part functioning as a convex lens;

a flat part positioned around said convex part;

and

an outer circumference part positioned around

20 said flat part,

said outer circumference part is fixed to said  
bobbin, and

said optical lens is placed so that a center  
axis of said convex part or an extension thereof passes

25 through the center hole of said bobbin.

33. An optical pickup as set forth in claim 32,  
wherein a mask layer is formed on a surface of said outer  
circumference part and said mask layer of said outer  
circumference part is fixed to said bobbin.

5        34. An optical pickup as set forth in claim 32,  
further having a magnet,

the center axis of said convex part coincides  
or substantially coincides with the center axis of the  
center hole of said bobbin,

10        a groove is formed around said convex part,  
the material of said bobbin is plastic,  
the material of said optical lens is glass, and  
said magnet and said coil configure an actuator  
for moving said bobbin.

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